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(56) Documents Cited

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(54) **Behenic acid containing fats**

(57) Fats comprising at least 40% BOO triglycerides and displaying a solid fat content of $N_{30} \geq 10$ and having a major peak above 23°C in its DSC were found to be excellent coating fats for confectionery coatings. (B = behenic acid, O=oleic acid)

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Behenic containing fats

5 In our co-pending European patent application 93309482.3
we have disclosed blends of sugar and triglycerides,
suitable for use in confectionary fillings or in ice-cream
coatings. The fats present must comprise:

- at least 40 wt% of SU_2 triglycerides
10 and 3-50 wt% of S_2U triglycerides

These glycerides are free of trans fatty acid residues and
display a solid fat-content (NMR-pulse, stabilised for 40
hours at 20°C) of:

$$N_{20} > 35 \text{ and } N_{30} < 10$$

- 15 (S being saturated fatty acid $C_{18}-C_{24}$; U being unsaturated
fatty acid $C_{18}+$).

Although above fats are excellent filling fats and fats
for ice-cream coatings these fats are less suitable for
confectionery coating, because of its low N_{30} -value.

- 20 Therefore we have studied, whether we could find fats that
are useful in confectionery coatings. This study resulted
in our invention. So our invention concerns fats,
comprising as main fatty acid constituents behenic acid,
oleic acid and optionally stearic acid and having a solid
25 fat content at 30°C of at least 10 (so: $N_{30} \geq 10$, NMR-
pulse, not stabilised), which fats contain at least 40 wt%
of BOO triglycerides and display in its differential
scanning calorimetry-diagram (D.S.C.) a major peak at a
temperature above 23°C, which D.S.C. is measured on a
30 Perkin-Elmer DSC-7, using a heating rate of 1°C/min. after
cooling of samples of 5-7 mg at -30°C, and heating them
from -10°C onwards.

- The exact position of the peak in the DSC depends on the
35 type of apparatus applied for the measurement, the heating
rate, the size of the samples and the starting

temperature. So above information on all these parameters is essential to get reproduceable DSC-results.

In fact the regime that we applied for the DSC measurement is as follows:

- 5 - melt fat at 100°C for 2 minutes;
- cool rapidly (100°C/min) to -30°C;
- heat rapidly (100°C/min) to 20°C and hold for 2 hours;
- cool rapidly (100°C/min.) to -10°C.
- 10 - record melting while heating at 1°C/min to 50°C.

Our fats contain at least 40 wt% of SU_2 and 3-50 wt% of S_2U triglycerides (S = saturated fatty acid $C_{18}-C_{22}$; U = unsaturated fatty acid $C_{18}+$). The behenic content of our fats is preferably more than 25 wt%, which make our fats
15 low-caloric fats, as it is known that behenic acid residues are less digested by the body.

Preferred fats contain at least 20 wt% of BOST triglycerides (B = behenic acid; O = oleic acid; St =
20 Stearic acid). It is however preferred to apply fats with a BOO/BOST-ratio of more than 1.8. It was further found, that in order to meet our N_{30} requirement, it is useful if our novel fats contain 0-3.5 wt%, preferably 0.5-1.5 wt% of diglycerides.

25 Our fats have SAFA-contents (= saturated fatty acids and trans fatty acids) of less than 45 wt%, while they have a ratio N_{30} over SAFA of more than 1.2. This makes our fat excellent coating fats, with a superb mouthfeel and melt-
30 down behaviour.

The fats according to the invention can be made by interesterification of natural fats, in particular applying chemical or enzymic interesterification of a
35 natural fat with a free fatty acid or a derivative thereof (such as an ester or an anhydride).

The fats can be blended with carbohydrates, in particular with sugars. In these blends the fat represents 40-80 wt% and the sugars 20-60 wt% of the total blend. In the coatings cocoa powder (5-30 wt% on coating-composition) milk proteins, (skim milk powder, butter milk powder, non-fat milk powder) in amounts of 2-20 wt% (on coating) and emulsifiers, such as lecithin can be present.

The sugar component can be selected from e.g. glucose, fructose, sucrose, maltose, maltodextrin etc. The nature of the sugar is not critical.

Although our fats can also contain linoleic acid as unsaturated fatty acid residue, it was found that fats with higher crystallisation rates were obtained when the amount of linoleic in our fats was restricted e.g. fats having a weight ratio

$$\frac{S_2 \text{ Ln}}{S_2 O} < 0.35 \quad (S = \text{saturated } C_{18}-C_{22}; O = \text{oleic})$$

acid, Ln = $C_{18:2}$) displayed the best crystallisation rates. It is preferred that the amount of $C_{18:2}$ in the 2-position is restricted to less than 50% of total unsaturated fatty acids present in the 2-position.

Coatings and chocolate bars provided with a coating, both containing as fat the fat composition according to the invention are also part of the invention.

Examples

1. Preparation of fat, high in BOO

High oleic sunflower (Trisun) and behenic acid (2:1 by weight) were interesterified using a 1,3 specific lipase (SP 392 from Novo) in a packed bed reactor at 70°C.

The fatty acid was stripped from the product at 260°C, 0.3-0.5 mm Hg to give a final fatty acid content of 2.2% in the triglyceride part.

The triglyceride product was fractionated in acetone at 13.5°C and -10°C to yield a mid fraction.

The mid fraction was neutralised, bleached and deodorised using standard procedures. This is called Fat B.

A sample of Fat B was dissolved in hexane and passed through a column of alumina and the hexane removed by distillation. The resulting product is called Fat A.

2. Fats high in BOO, containing BOST

Oleine from StOSt production (rich in StOO) and behenic acid (1:1 by weight) were reacted in hexane at 58°C in the presence of 1,3 specific lipase (SP392 from Novo). The reaction mixture was filtered and hexane removed by distillation. The reaction product was purified by passing through an alumina column.

The purified product was fractionated in acetone at 25°C and 5°C to yield a mid fraction, called Fat C.

Analysis:

FAT A: BOO = 70.0 wt% (of triglycerides),
SAFA = 42.7 wt% (total).
FAT B: BOO = 70.0 wt% (of triglycerides),
SAFA = 42.0 wt% (total).
FAT C: containing 51 wt% of BOO and
23 wt% of BOST
0 wt% of diglycerides
having an N_{30} = 36
and a SAFA = 51.6%
displaying a peak in its DSC at 28.7

3. Chocolate bars

3.1 The following overall recipe was applied:

<u>Recipe:</u>	<u>wt%</u>
Cocoa powder (10/12)	14
Skim milk powder	7
Sugar	48
Fat	31
Lecithin	0.4

The following fats were applied:

Fat A: containing 70 wt% of BOO and
2.0 wt% of diglycerides
having an N_{30} = 36.7
and a SAFA = 42.7%
displaying peaks in its DSC at 20.5 and
at 28.8

Fat B: containing 70 wt% of B00 and
 4.5 wt% of diglycerides
 having an $N_{30} = 1.4$
 and a SAFA = 42 %
 displaying a peak in its DSC at 21.0

- 3.2 Chocolate bars were moulded by cooling below 0°C to crystallise. Then warming up to 25°C to demould. The bars were stored at 30°C. Hardness was measured using a penetrometer with a 50 g, 9° cone for 5 seconds.

Results found:

<u>Fat</u>	<u>Hardness Kg/cm²</u>	<u>Sensory at 30°C</u>
A	3.5	firm, cohesive
B	too soft	sticky, melted

- 4.1 A fat was prepared by enzymically interesterifying HOSF with behenic acid followed by fractionation and treatment with alumina. The fat had the following composition:

Carbon number GC

<u>C50</u>	<u>C52</u>	<u>C54</u>	<u>C56</u>	<u>C58</u>	<u>C60</u>	<u>C62</u>
0.2	1.6	7.3	10.2	76.1	3.0	1.6

FAME GC

<u>C16:0</u>	<u>C16:1</u>	<u>C18:0</u>	<u>C18:1</u>	<u>C18:2</u>
2.3	0.1	3.3	57.5	2.5
<u>C20:0</u>	<u>C22:0</u>	<u>C24:0</u>		
2.2	31.3	0.7		

Ag+ HPLC

<u>SSS</u>	<u>S2O</u>	<u>S2Ln</u>	<u>S02</u>	<u>SOLn</u>	<u>000</u>	<u>>3db</u>
0.0	11.2	0.6	78.9	4.3	4.3	0.7

Straight Phase HPLC

<u>1,3DG</u>	<u>1,2DG</u>	<u>Peroxides</u>	<u>Sterol esters</u>	<u>MG</u>
0.0	0.0	0.3	0.5	0.1

N-values (unstabilised, NMR)

<u>N20</u>	<u>N25</u>	<u>N30</u>	<u>N32.5</u>
85.1	77.7	52.9	0.1

Differential Scanning Calorimetry

(Sample melted at 100°C for 2 minutes, cooled as fast as possible to -30°C, reheated to 20°C and held at this temperature for 2 hours, cooled as fast as possible to -10°C then heated at 1°C/minute to 50°C; thermogram recorded during the final step.)

Main peak at 28.7°C.

4.2 A chocolate coating was prepared using this fat.

Defatted cocoa powder (16 parts), skimmed milk powder (8 parts), sugar (55 parts) and fat (21 parts) were mixed together with lecithin (0.2 parts) in a standard dough mixer. The resultant paste was passed through a three roll mill refiner to produce a refined flake. This flake (88 parts) was combined with further fat (12 parts) and lecithin (0.2 parts) in an end-runner conch. The resulting chocolate coating was conched for 5 hours at 55°C.

Digestive biscuits were half coated with the chocolate coating at 50°C, excess coating being removed by cold air blower. The coated biscuits were cooled at 5°C overnight and stored at 25°C for one day before storing at 15°C, 20°C or 25°C. The coating was hard and had a fair gloss which remained substantially unchanged for four months at 20°C and 25°C but became slightly duller at 15°C.

CLAIMS

1. Fats, comprising as main fatty acid constituents behenic acid, oleic acid and optionally stearic acid and having a solid fat content at 30°C of at least 10 (so: $N_m \geq 10$, NMR-pulse, not stabilised), which fats contain at least 40 wt% of BOO triglycerides and display in its differential scanning calorimetry-diagram (D.S.C.) a major peak at a temperature above 23°C, which D.S.C. is measured on a Perkin-Elmer DSC-7, using a heating rate of 1°C/min. after cooling of samples of 5-7 mg at -30°C, and heating them from -10°C onwards.
2. Fats, according to Claim 1 having a content of SU_2 triglyceride of more than 40 wt% and of S_2U triglycerides of 3-50 wt%.
3. Fats, according to Claims 1 and 2, having a behenic acid content of at least 25 wt%.
4. Fats, according to Claims 1 - 3, having a content of BOST triglycerides of at least 20 wt% (B = behenic acid; O = oleic acid; St = stearic acid).
5. Fats, according to Claims 1 - 4, having a diglyceride content of 0-3.5 wt%, preferably 0.5-1.5 wt%.
6. Fats, according to Claims 1 - 5, having a content of saturated fatty acids (= SAFA) of less than 45%.
7. Fats, according to Claims 1 - 6, having an $N_{20} > 35$ and a ratio: $N_{20}/SAFA$ of more than 1.2.
8. Coating for confectionery products, comprising a fat wherein the fat is a fat according to Claims 1 - 7.

9. Chocolate bars, provided with a coating, wherein the coating is the coating according to Claim 8.



Application No: GB 9601758.7
Claims searched: 1-9

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.O): C5C (CMA,CMB,CMG,CPA,CPC); A2B (BMC5, BMC15)
Int CI (Ed.6): A23D 9/00; A23G 1/00; C11C 3/10
Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0276548 A1 (FUJI) see whole document	1
A	EP 0227364 A2 (FUJI) see Examples	1
A	EP 0196780 A2 (KAO) see Synthesis Examples	1
A	WO 95/14392 A1 (LODERS) see whole document	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.